acetic acid, but other products of oxidation are obtained in less quantity; these are formic acid, acetal, acetic ether, saccharic acid, gloxal, glyoxilic acid, and glycolic acid, the final products being water and carbonic acid. When the elements of water are removed from absolute alcohol, ether is formed."

Now for a few words of criticism, or rather of suggestion. The book is not quite free from mistakes, probably in most cases printers' errors, which ought by all means to be avoided in a Dictionary, and will doubtless be corrected when a second edition is called for, which we hope may be very soon. But what we find most fault with is the cross-references, which are needlessly complicated, and often misleading. Being anxious to see what was said about the latest discoveries in Spectrum Analysis, we turned to the article under that heading, which we found to be very clear as far as it went. At the end we were referred "for further information" to five other articles; of these, "Spectra of the Elements" and "Metallic Spectra" are not to be found; "Spectra, Metallic," does occur, but simply refers us again to "Coloured Flames," under which we found only two lines relating to spectroscopy. Neither of the articles referred to gave us any further information of importance on the subject.

One other criticism on another sentence in the preface. We observe with pleasure that this is to be the first of a series of similar dictionaries, which shall embrace the other departments of Science. One, it is stated, will have for its subject the "classificatory sciences" of Botany and Zoology. Now we must protest against the use of this term as applied to the two sciences named. Zoology and Botany have their physiological as well as their systematic side, and far the more important of the two. We trust that the forthcoming dictionaries will be framed on no such narrow basis as that implied in the denunciations by Mr. Emerson and Mr. Ruskin of the pursuit of botany as "a mere science of names." When these volumes are published, some confusion may possibly arise from the title "Dictionary of Science" having been given to this work, when it should have been more correctly "Dictionary of Physical Science."

The book is however an indispensable addition to the library of every student, and we cordially recommend it to the notice of our readers.

A. W. B.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his Correspondents. No notice is taken of anonymous communications.*]

Ocean Currents

I do not altogether agree with Mr. Johnston in concluding that his suggestion as to the influence of barometric differences on Ocean Currents was stated with insufficient clearness. His words were:—"The waters which lie under the high pressure area have a tendency to escape from under the excessive weight, towards the space over which the pressure is less;"—and about the meaning of this sentence there can be no dispute. It seems to me rather that Mr. Johnston, in his letter in NATURE for Feb. 2, is changing his ground; and whilst he formerly distinctly suggested the probability of the currents being due to mean differences of pressure stationary over certain oceanic areas, he now wishes to attribute them to the *motion* of centres of low pressure. This is quite a different thing, and is so far admissible, that what Piddington aptly called "storm-currents," attendant on tropical cyclones, are undoubtedly caused in such a way. But these storm-currents are very exceptional; within the tropics, where their excessive development renders them most noticeable, they occur only in the hurricane months, and even then only at intervals; they have clearly no connection with the continuous current which flows west all through the year, and besides the great depressions of the barometer which give rise to these, there are no others. The barometer in tropical latitudes is remarkably constant, and shows no centres of low pressure passing continually towards the west. in the direction of the Trade-winds or the Equatorial Currents. The Equatorial Currents are thus clearly not due in the slightest degree to differences of barometric pressure, either to those that are stationary, as Mr. Johnston now seems to admit, or to moving ones which exist only at rare intervals.

It is however certain that centres of low pressure, round which the air circles, do very frequently pass along in temperate latitudes, driven (it seems to me) by the prevalent west wind. In our own latitudes, and more especially in the winter months, these succeed each other at intervals of a few days, and though their action is intermittent, and for the most part peculiar to winter, I see no reason to doubt that they carry with them a species of storm-current, which does occasionally modify and even intensify the prevailing easterly drift. But it is in the highest degree improbable that the *formation* of these centres of low pressure can give rise to any appreciable currents. Even towards the centre of a cyclone, the barometric gradient does not exceed one inch in fifty miles; which, so far as its effect on the ocean is concerned, is equivalent to a difference of water-level of one-fourth of an inch in a mile; and even this can only exist if we suppose the barometric depression to be formed almost instantaneously. There is no evidence that it is so formed; and the longer it takes to arrive at its maximum, the more gradually does the water rise into the central space, and the more infinitesimal is the velocity with which it does so.

Mr. Johnston rightly corrects the slip which appeared in my former letter, of twenty miles *an hour*, instead of *a day*, and thinks that even twenty miles a day is too large an estimate of the velocity of the equatorial current of the North Atlantic; but the Admiralty chart to which he refers shows many instances of a velocity still greater; and whatever force produces the current must clearly be adequate to the production of the greatest velocity it attains. This, however, is of no consequence to my argument. The barometer decreases very steadily, regularly, and gradually, from the patch of permanent high pressure to the line; and the effect of the formation of this patch would therefore be equivalent—as I said before—to a difference of water-level of about four inches in 1,800 miles; a difference which could no more generate a current of ten miles a day than it could one of twenty; but as whatever effect it was capable of producing was produced, once for all, many ages ago, the consideration of it has no direct bearing on the currents of the present day.

I would, therefore, repeat that neither as permanently existing nor as changing with the seasons, neither in their continuance, nor in their formation, nor in their fluctuations, can the areas of high and low pressure, which Mr. Buchan has delineated, and which formed the subject of Mr. Johnston's first letter, produce an appreciable effect on the Ocean Currents; and that, since the Equatorial Currents in the several oceans follow the course of the Trade-winds, and are not affected by transitory differences of pressure which do not exist in the Trade-wind region, the movement of these differences of pressure where they do exist, cannot be considered as causing the current, or as necessary to its flow, though it may occasionally give it an increased velocity. But any effect so produced is due not to the mere existence or formation of a centre of low pressure, but to its *onward movement;* and to urge that this onward movement exercises an influence on the currents, is merely to urge, with respect to one not very important detail, the application of that principle which, in its widest sense, I have already maintained through a long chapter in my Physical Geography, and which Mr. Croll is now maintaining in the *Philosophical Magazine*—that the Ocean Currents are due entirely to the action of wind.

J. K. LAUGHTON

Royal Naval College, Portsmouth, Feb. 5

In reference to the exchange current found to exist between the Mediterranean and Atlantic, at the Straits of Gibraltar, it seems a matter for inquiry how far the rise of the ocean bed,

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just outside the Straits, is natural; and how far it may have been formed or increased by deposits left during the successive ages, by this undercurrent of out-set-water, from the Mediterranean Sea into the Atlantic Ocean.

A. H.

Jan. 19

The Frost

HAVING seen notices in your journal about the severity of the late frost, I beg to state that its duration and severity have been most remarkable here, and unequalled, as far as my knowledge extends, for many years back. My instruments are standard ones, which have been recently compared at Kew, and placed in my garden quite detached from buildings, and facing the N.E. at 4ft. elevation. I append a table of the observations, which may be interesting to some of your readers:--

Dec. 1870.	Shade max.	Shade min.	Exposed min.	Jan. 1871.	Shade. max	Shade. min.	Exposed. min.
20	47·8	30	30	1	27·5	19·8	18·2
21	30	22·8	22	2	26	24	24
22	26·8	15	15	3	33	21·5	21·5
23	29	1·5	0	4	31	14	13
24	24	−2	−3·5	5	39	23	23
25	28	+3	+3	6	42·2	31	31
26	33	24	23	7	45	30	29·5
27	31	24	23·5	8	40	28·3	28·3
28	32·2	27	27	9	40	25·3	25
29	32·8	10·5	10	10	40	28	28
30	31·6	15	14·5	11	36	30·5	29
31	32·8	15·2	14·3	12	35·8	20·5	20
				13	35·6	26·5	26

The frost was succeeded by a heavy gale of wind and a deluge of rain; in four days 2¼ inches fell, one inch being between 9 A.M. 17th, and 9 A.M. on the 18th. This, together with the melting of the snow, inundated the valley of the Medway round us for miles. The greatest cold I ever registered here was on January 4, 1867, being 5° below zero. The highest shade temperature I have recorded was 100°·5 on July 22, 1868, which was the hottest summer ever experienced.

Tunbridge

G. H. FIELDING

Caves near St. Asaph

IT will interest archæologists to know that new caves are being opened by Mr. Townshend Mainwaring in the neighbourhood of St. Asaph, and that already we have much additional evidence brought to light as to the early inhabitants of that part of the country. In one which appears to run downward into the cliff at Carregwen, near Galltfænan, remains of various animals have been found in brown cave-earth, among them one which has been determined to be that of a reindeer, by Mr. Dawkins, who is further of opinion that it has been gnawed by a wolf or hyæna. This is very interesting, as the cave is high up in the face of a precipice, and with the present physical geography the larger animals could not get into that cave except by being carried there; so that we have here either cave-earth containing remains of such a remote antiquity that the gorge below has been considerably altered since its accumulation, or we have the ancient abode of carnivorous beasts able to carry the large animals into their den.

In Brysgill, Mr. Mainwaring has met with greater success. From the rubbish and tumble under the rock shelter outside the mouth of a large cave, he has obtained a fine bone scraper ground to a sharp edge, several flint flakes and bones of man, horse, ox, sheep, hog, &c. Inside the cave, immediately under the recent mould, there is a broken stalagmite floor, associated with which were human bones and the flint flakes, and cores. At about two feet below the broken stalagmite floor, the bones of a horse were found in undisturbed brown earth. Here we have evidently the home of some of our troglodytic ancestors who manufactured their flakes in the cave from flint which they may have procured from the drift not far off.

This is only one of a number of most promising looking caves to which Mr. Dawkins some time ago called attention, and it is to be hoped that, with so many residents in the neighbourhood interested in scientific investigation, we may have them all systematically explored, and not lose any bit of important evidence from the want of observation at the time of discovery.

T. McK. HUGHES

The Primary Colours

ONE more proof that violet is a primary. Place a hand prism between the eye and the sunlight so as to show the prismatic colours. Then hold a sheet of yellow glass between the prism and the light, and observe the result. The reds and yellows are scarcely altered, the greens are very greatly intensified, the blues and violets are altogether extinguished. If violet had really any red in it, the yellow glass, which does not stop the red rays, would change the violet to red, or would show at least some *trace* of red where the violet had been. Instead of this, the violet is totally stopped out, and the space which it occupied left dark. Wherever the secondary *pink* appears, this is changed to red by the stopping of the violet rays. The increased strength and brilliancy of the green shows clearly also the primary character of this colour. It is usually much weakened in the spectrum by mixture with the far-spreading violets; when this is removed it comes out in full splendour. I commend this little experiment to amateurs; it is simple and interesting. The same effect is produced by throwing the coloured spectrum on to a white wall, and holding the yellow glass between the prism and the wall.

Leicester, Feb. 20

FREDERICK T. MOTT

Californian Oaks

IN NATURE, No. 68, p. 313, you did me the honour to quote a paper of mine in reference to the edible qualities of some of the Californian oak acorns. You will, however, allow me to state that, though this is true of some species, such as *Quercus lobata* Nee, which was the one I chiefly referred to in the passage quoted, yet that the acorns of others have a decidedly injurious effect, or are inedible. For instance, it is very commonly believed by the *rancheros* that the acorns of *Q. Kelloggii* Newb. give rise among pigs to a peculiar disease of the kidneys, while the acorns of a new species from Southern Oregon—which I shall shortly describe in a work now in the press—(*Q. echinoides* mihi) are so very bitter that no animal but the black bear (*Ursus Americanus*) will eat them, and it only when pressed by hunger. On the other hand the acorns of *Quercus Orstediana* (mihi), another as yet undescribed species, are so nutritious, that though the species never grows to a greater size than a small shrub, the produce of forty or fifty such bushes will fatten a hog. Again, there is a difference of quality among the edible species. The "digger" Indian, who is quite a *connoisseur* in acorns, makes a difference; for while the interior tribes prefer those of *Q. lobata*, those living near the coast chiefly affect *Q. sonomensis* Benth. Though pigs fatten freely on the acorns of *Quercus Garryana* Dougl., and in California on those of its ally, *Q. Douglasii* Hook., yet I never knew the Indians either in Vancouver Island or in California eat the acorns of either species, while those of *Q. agrifolia* Nee, *Q. chrysolepis* Liebm., *Q. densiflora* Hook. and Arn., *Q. Sadleriana* mihi (nondescript species), &c., are not, so far as I am aware, eaten by any animal but squirrels. The fruit of *Castanopsis chrysophylla* Doug., a plant allied to the oaks and chestnuts, is, however, in great favour with the black bear. I have eaten the acorns cooked in the manner described in the extract, and—I suppose in common with other naturalists in the less explored parts of North-west America—have been forced by hunger to search for the acorns which *el carpentero* (*Melanerpes torquatus*) stores away for its use in the spongy bark of *Torreya*, *Sequoia*, *Pinus*, and various other trees, yet notwithstanding the sauce which famine gave to my appetite, I must confess that they were by no means palatable. This may, however, have been prejudice, for the Ancient Britons—who were by no means savages in the ordinary acceptation of the term—ate the acorns of *Quercus robur*, the common oak of this country. How they cooked them we are not informed. I presume, however, that it was not in so *recherché* a style as practised by some aboriginal friends of Mr. Paul Kane, the artist—a full description of which those curious in North American Indian *cuisine* will find in that gentleman's book descriptive of his journey across the American continent.

ROBERT BROWN

Edinburgh, Feb. 20

THE ECLIPSE PHOTOGRAPHS

THE accompanying woodcut is a copy of a drawing made from the negative No. 5, taken at Syracuse during the Eclipse of the sun on Dec. 22 last. When viewed by transmitted light, the negative shows chiefly the portions indicated by the unshaded parts, and the red

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